

Imperial College London Participation

Clean Aviation Joint Undertaking

Introduction

This booklet comprises the Project under the Clean Aviation Joint Undertaking that Imperial participate in as an Associated Partner. Funding from UKRI Horizon Guarantee.

Table of contents

Hydrogen Engine Architecture Virtually Engineered Novelty (HEAVEN)	2
--	---

Hydrogen Engine Architecture Virtually Engineered Novelty

Fact Sheet

Project Information

HEAVEN

Grant agreement ID: 101102004

DOI

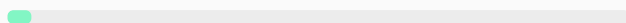
[10.3030/101102004](https://doi.org/10.3030/101102004) 

Start date

1 January 2023

End date

31 December 2026



Funded under

Climate, Energy and Mobility

Total cost

€ 35 639 788,50

EU contribution

€ 29 906 036,25

Coordinated by

ROLLS-ROYCE DEUTSCHLAND
LTD & CO KG

 Germany

Objective

Climate-neutral aviation will require the use of alternative fuels such as Green Hydrogen and Sustainable Aviation Fuel (SAF) combined with the power density of an ultra-efficient gas turbine engine for the Small and Medium Range (SMR) market which corresponds to approximately 50% of the current share of air transport emissions. Rolls-Royce (represented within the HEAVEN project by RR-UK, RR-D and ITP) supported by key UK and European academia, industry and research centres are currently developing a new generation of very high bypass ratio geared engine architecture called UltraFan® which was started in 2014. From the beginning this ducted engine architecture has been designed to be scalable and meet the needs both of widebody and SMR markets. To achieve the necessary 20% fuel burn reduction Rolls-Royce proposes to significantly evolve the UltraFan design into UltraFan H2. The evolved engine architecture design will take the next steps in

improving the efficiency of the gas turbine, take advantage of the properties of net zero carbon fuels such as Hydrogen to improve efficiency, combining this with Hybrid electric technology to reduce wasted energy. Numerous innovative enabling technologies already at TR3 will be incorporated into this new architecture to improve the gas turbine efficiency. Together with work proposed on Hydrogen in CAVENDISH (HRA-01) and Hybrid Electric in HE-ART (HER-01) Clean Aviation proposals in conjunction with activities in national and regional programmes, this will be synergistically combined to validate up to TRL6 the highly innovative UltraFan H2 design to support a 2035 EIS. HEAVEN brings together a highly specialised European industrial and academic consortium already strongly involved and familiar with the UltraFan programme. Additionally, the partner easyJet, European airline operator who have the largest fleet of European manufactured SMR aircraft operating in Europe will bring an in depth knowledge of operational requirements and i

Fields of science

[engineering and technology](#) > [mechanical engineering](#) > [vehicle engineering](#) > [aerospace engineering](#) > **aircraft**

[engineering and technology](#) > [environmental engineering](#) > **energy and fuels**

Keywords

Aerospace engine efficiency

Engine Architecture

Hybridisation

combustion

Hydrogen

SAF fuel

Advanced cycles

Propulsion System

Geared

Innovative

Disruptive

Net Zero

Sustainable

Scalabcycles

Programme(s)

[HORIZON.2.5 - Climate, Energy and Mobility](#)

MAIN PROGRAMME

[HORIZON.2.5.7 - Clean, Safe and Accessible Transport and Mobility](#)

Topic(s)

[HORIZON-JU-CLEAN-AVIATION-2022-01-SMR-01 - Ultra Efficient Propulsion Systems for Short and Short-Medium Range Aircraft](#)

Call for proposal

HORIZON-JU-Clean-Aviation-2022-01

[See other projects for this call](#)

Funding Scheme

IA - Innovation action

Coordinator



ROLLS-ROYCE DEUTSCHLAND LTD & CO KG

Net EU contribution

€ 7 304 989,75

Address

Eschenweg 11

15827 Blankenfelde-mahlow

 **Germany** 

Region

Brandenburg > Brandenburg > Teltow-Fläming

Activity type

Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

€ 3 130 710,25

Participants (9)

 **THIRD-PARTY** 

AEROSPACE TRANSMISSION TECHNOLOGIES GMBH

 **Germany**

Net EU contribution

€ 417 287,50

Address

Adelheidstrasse 40
88046 Friedrichshafen 

Region

Baden-Württemberg › **Tübingen** › **Bodenseekreis**

Activity type

Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links

[Contact the organisation](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

€ 178 837,50



INDUSTRIA DE TURBO PROPULSORES S.A.U.

 Spain

Net EU contribution

€ 2 994 034,75

Address

Parque Tecnologico De Zamudio 300
48170 Zamudio-vizcaya 

Region

Noreste › **País Vasco** › **Bizkaia**

Activity type

Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

€ 1 283 157,75

 **THIRD-PARTY** 

ITP NEXT GENERATION TURBINES SOCIEDAD LIMITADA


 Spain

Net EU contribution

NET EU CONTRIBUTION

€ 1 952 790,00

Address

Parque Tecnológico, 300
48170 Zamudio Vizcaya 

Region

Noreste > País Vasco > Bizkaia

Activity type

Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links

[Contact the organisation](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

€ 836 910,00



FUNDACION CENTRO DE TECNOLOGIAS AERONAUTICAS

 Spain

Net EU contribution

€ 3 235 543,75

Address

Parque Tecnológico De Alava (Minano), C/ Juan De La Cierva 1
01510 Minano (Alava) 

Region

Noreste > País Vasco > Araba/Álava

Activity type

Research Organisations

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

€ 0,00



SKF AEROSPACE FRANCE

 France

Net EU contribution

€ 709 652,00

Address

34 Avenue Des Trois Peuples
78180 Montigny Le Bretonneux 

Region

Ile-de-France > Ile-de-France > Yvelines

Activity type

Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

€ 304 136,75



STICHTING DUIJS-NEDERLANDSE WINDTUNNELS

 Netherlands

Net EU contribution

€ 9 245 250,00

Address

Voorsterweg 31
8316 PR Marknesse 

Region

Oost-Nederland > Flevoland > Flevoland

Activity type

Research Organisations

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

€ 0,00



TECHNISCHE UNIVERSITAT DARMSTADT

Germany

Net EU contribution

€ 1 646 000,00

Address

Karolinenplatz 5
64289 Darmstadt

Region

Darmstadt > **Darmstadt, Kreisfreie Stadt**

Activity type

Higher or Secondary Education Establishments

Links

[Contact the organisation](#) [Website](#)

[Participation in EU R&I programmes](#)

[HORIZON collaboration network](#)

Other funding

€ 0,00



UNIVERSIDAD POLITECNICA DE MADRID

Spain

Net EU contribution

€ 703 750,00

Address

Calle Ramiro De Maeztu 7 Edificio Rectorado
28040 Madrid

Region

Comunidad de Madrid > **Comunidad de Madrid** > **Madrid**

Activity type

Higher or Secondary Education Establishments

Links

[Contact the organisation](#) [Website](#)

[Participation in EU R&I programmes](#)

[HORIZON collaboration network](#)

Other funding

€ 0,00



DEUTSCHES ZENTRUM FÜR LUFT - UND RAUMFAHRT EV

 Germany

Net EU contribution

€ 1 696 738,50

Address

Linder Hohe

51147 Köln 

Region

Nordrhein-Westfalen > Köln > Köln, Kreisfreie Stadt

Activity type

Research Organisations

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

€ 0,00

Partners (10)



THE UNIVERSITY OF SHEFFIELD

 United Kingdom

Net EU contribution

€ 0,00

Address

Firth Court Western Bank

S10 2TN Sheffield 

Region

Yorkshire and the Humber > South Yorkshire > Sheffield

Activity type

Higher or Secondary Education Establishments

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

No data



ITP AERO UK LTD

 United Kingdom

Net EU contribution

€ 0,00

Address

**The Whittle Estate Cambridge Road,
LE8 6LH Whetstone** 

Region

**East Midlands (England) > Leicestershire, Rutland and Northamptonshire > Leicestershire
CC and Rutland**

Activity type

Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links

[Contact the organisation](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

No data



EASYJET AIRLINE COMPANY LIMITED

 United Kingdom

Net EU contribution

€ 0,00

Address

**Hangar 89 London Luton Airport
LU2 9PF Luton Bedfordshire** 

Region

Activity type

Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links

[Contact the organisation](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

No data



LOUGHBOROUGH UNIVERSITY

 United Kingdom

Net EU contribution

€ 0,00

Address

Ashby Road

LE11 3TU Loughborough 

Region

**East Midlands (England) > Leicestershire, Rutland and Northamptonshire > Leicestershire
CC and Rutland**

Activity type

Higher or Secondary Education Establishments

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

No data



THE UNIVERSITY OF NOTTINGHAM

 United Kingdom

Net EU contribution

€ 0,00

Address

University Park

NG7 2RD Nottingham 

Region

East Midlands (England) > Derbyshire and Nottinghamshire > Nottingham

Activity type

Higher or Secondary Education Establishments

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

No data



IMPERIAL COLLEGE OF SCIENCE TECHNOLOGY AND MEDICINE

 United Kingdom

Net EU contribution

€ 0,00

Address

South Kensington Campus Exhibition Road

SW7 2AZ London 

Region

London > Inner London — West > Westminster

Activity type

Higher or Secondary Education Establishments

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

No data



THE CHANCELLOR MASTERS AND SCHOLARS OF THE UNIVERSITY OF CAMBRIDGE

 United Kingdom

Net EU contribution

€ 0,00

€ 0,00

Address

**Trinity Lane The Old Schools
CB2 1TN Cambridge** 

Region

East of England > East Anglia > Cambridgeshire CC

Activity type

Higher or Secondary Education Establishments

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

No data



**THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF
OXFORD**

 United Kingdom

Net EU contribution

€ 0,00

Address

**Wellington Square University Offices
OX1 2JD Oxford** 

Region

South East (England) > Berkshire, Buckinghamshire and Oxfordshire > Oxfordshire

Activity type

Higher or Secondary Education Establishments

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

No data



CRANFIELD UNIVERSITY

 United Kingdom

Net EU contribution

€ 0,00

Address

College Road

MK43 0AL Cranfield - Bedfordshire 

Region

East of England > Bedfordshire and Hertfordshire > Central Bedfordshire

Activity type

Higher or Secondary Education Establishments

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

No data



ROLLS-ROYCE PLC

 United Kingdom

Net EU contribution

€ 0,00

Address

Kings Place 90 York Way

N1 9FX London 

Region

London > Inner London — West > Camden and City of London

Activity type

Private for-profit entities (excluding Higher or Secondary Education Establishments)

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Other funding

No data

EC signature date: 9 December 2022

Last update: 16 December 2022

Record number: 243685

Permalink: <https://cordis.europa.eu/project/id/101102004>

© European Union, 2023